Solution by G. B. M. ZERR, A.M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia. Pa.

Let $a=20°$=altitude, $a'=31°$=altitude, φ=latitude, $\delta=15°$=declination, $\theta=15°$=sun's angular path for one hour, h=hour angle.

$$\therefore \cos h=\frac{\sin a-\sin\varphi\sin\delta}{\cos\varphi\cos\delta},\ \cos[h-\theta]=\frac{\sin a'-\sin\varphi\sin\delta}{\cos\varphi\cos\delta}.$$

Eliminating h, we get

$$[\sin a-\sin\varphi\sin\delta]\cos\theta+\{\cos^2\varphi\cos^2\delta-[\sin a-\sin\varphi\sin\delta]^2\}^{\frac{1}{2}}\sin\theta=\sin a'-\sin\varphi\sin\delta.$$

But $\theta=\delta$. $\therefore \sin^2\varphi\sin^2\delta[2+\cos\delta]-2\sin\varphi\sin\delta[1-\cos\delta][\sin a+\sin a']$

$$=\cos^2\delta\sin^2\delta+2\sin a\sin a'\cos\delta-\sin^2 a-\sin^2 a'.$$

$\therefore$ $.067055\sin^2\varphi-.015126\sin\varphi=.020553$; $\sin^2\varphi-.2256\sin\varphi=.3065$.

$\sin\varphi=.6778$ or $-.4522$; $\varphi=42°\ 40'\ 30''$.

115. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College Defiance, Ohio.

Determine geometrically where to stand so as to be able to throw a stone over a tree with the minimum velocity.

Solution by G. B. M. ZERR, A.M., Ph.D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

The velocity of projection is the same as a body would acquire in falling from the directrix of the parabolic path to the point of projection.

$\therefore$ The velocity will be a minimum when the directrix is the least distance above the top of the tree. This is the case when you stand at the base of the tree, then the directrix passes just above the tree.

PROBLEMS FOR SOLUTION.

ARITHMETIC.

164. Proposed by JOSEPH V. COLLINS, Ph. D., Professor of Mathematics, State Normal School. Stevens Point, Wis.

Three women, the first with ten eggs, the second with thirty, and the third with fifty, went to market. They each got the same for their eggs, and all returned with the same money. What did they get?